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(71) Applicants
Kuhbier GmbH & Co.,
5290 Wipperfürth,
Federal Republic of Germany.
(72) Inventor
Alfons Motsch
(74) Agents
Dr. Walther Wolff & Co.

# (54) Bearing housing

(57) A bearing housing (1 and 2) is constructed of plastics material and is adapted to compensate during assembly for any deformation which may occur during the moulding thereof. It comprises a bearing chamber (8), the circumferential surface of which is provided with riblike or knoblike protrusions (17) directed towards the longitudinal axis of the chamber.

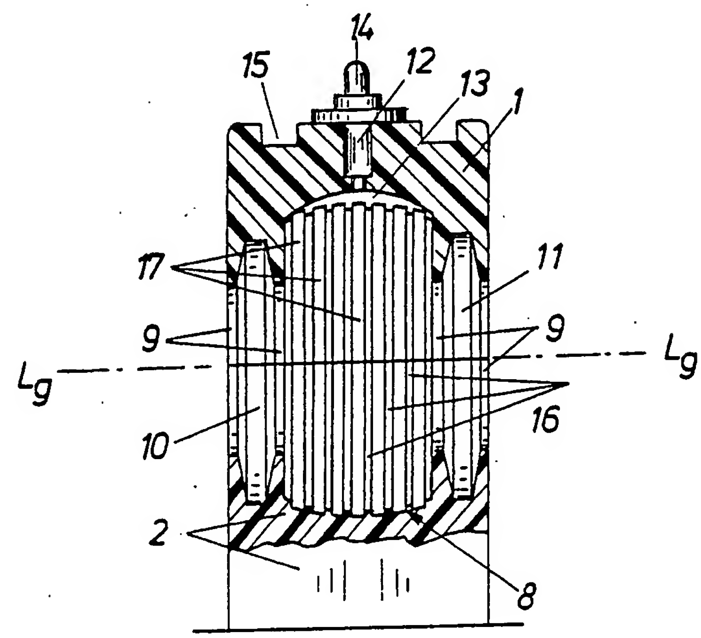


Fig.5

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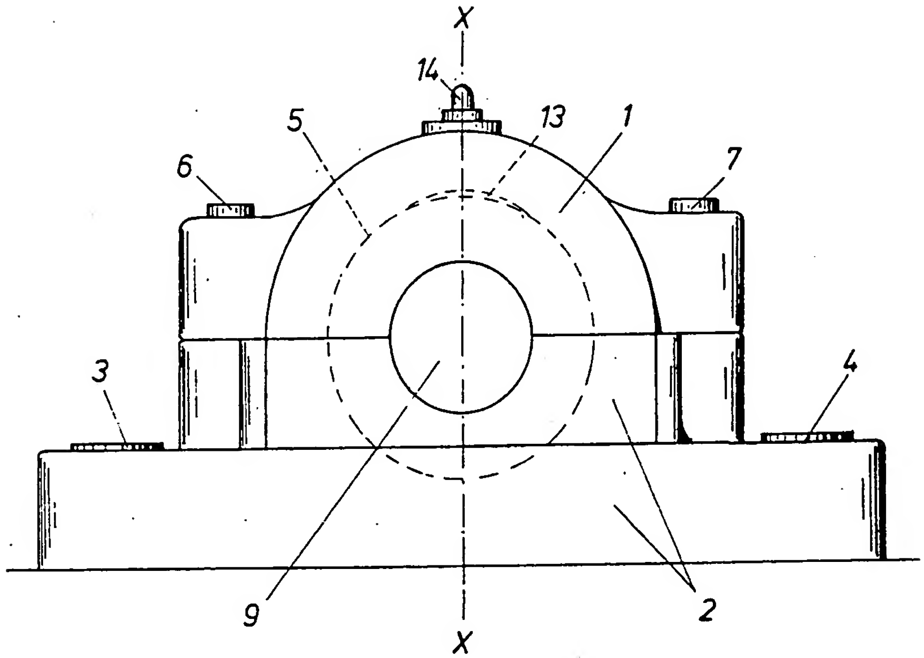


Fig.1

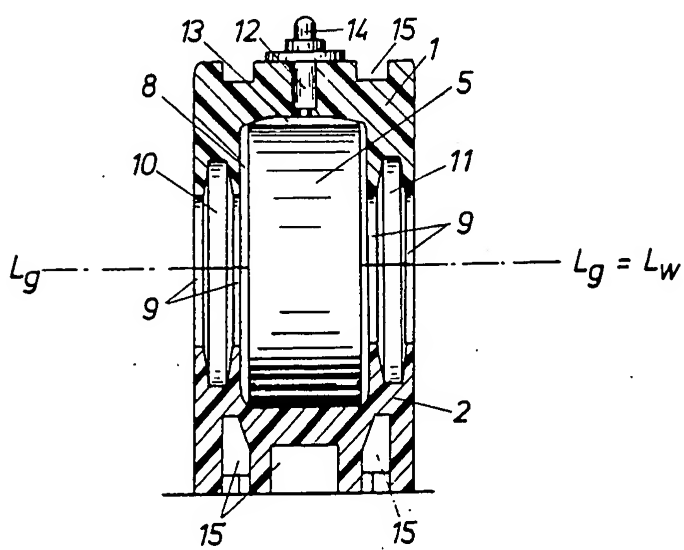


Fig.2

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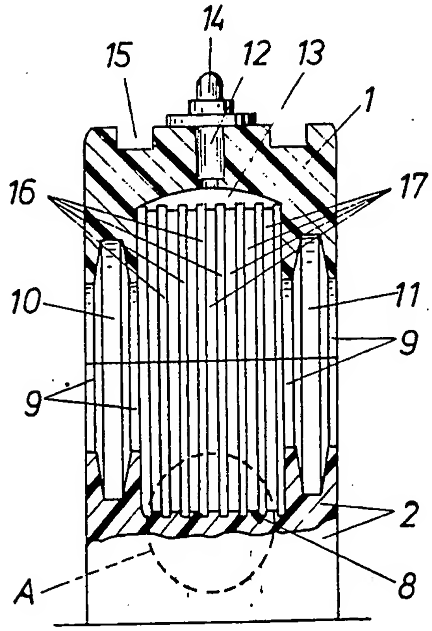



Fig. 3

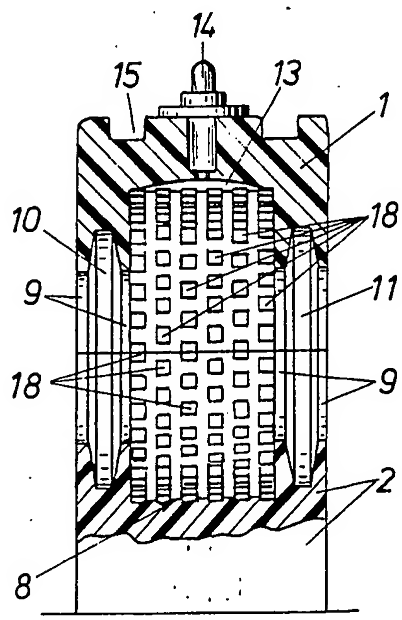



Fig. 4

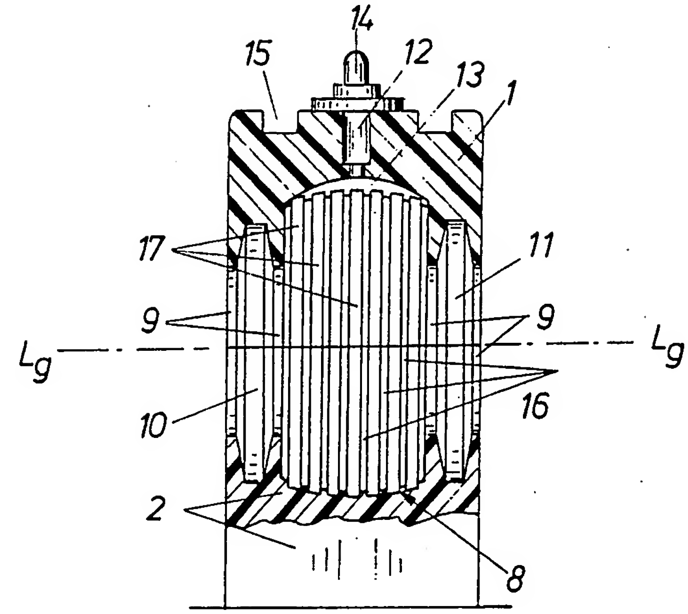
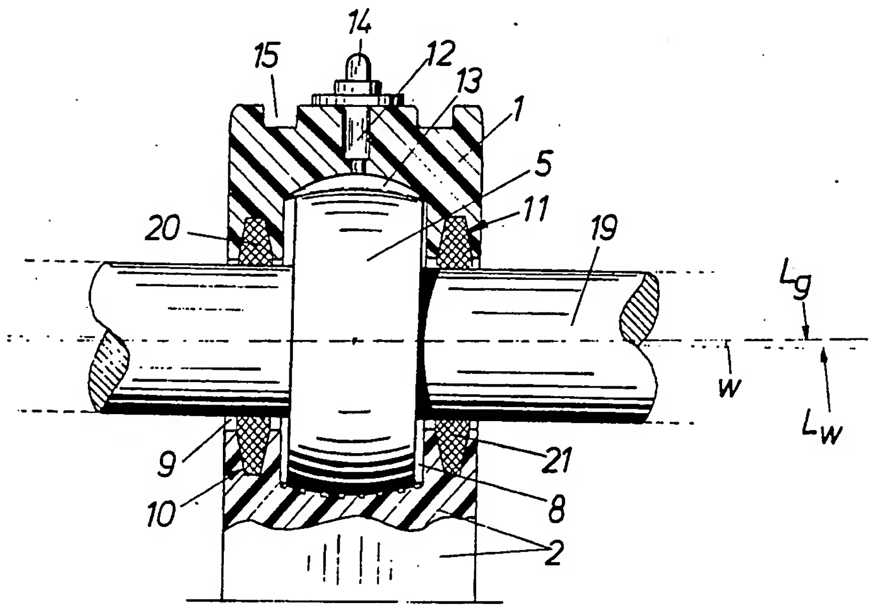

14
15
12
13
1
17
11
9
9
Lg
Lg
10
16
2
8

Fig.5


14
15
12
13
1
5
20
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19
Lg
w
Lw
9
21
10
8
2

Fig.6

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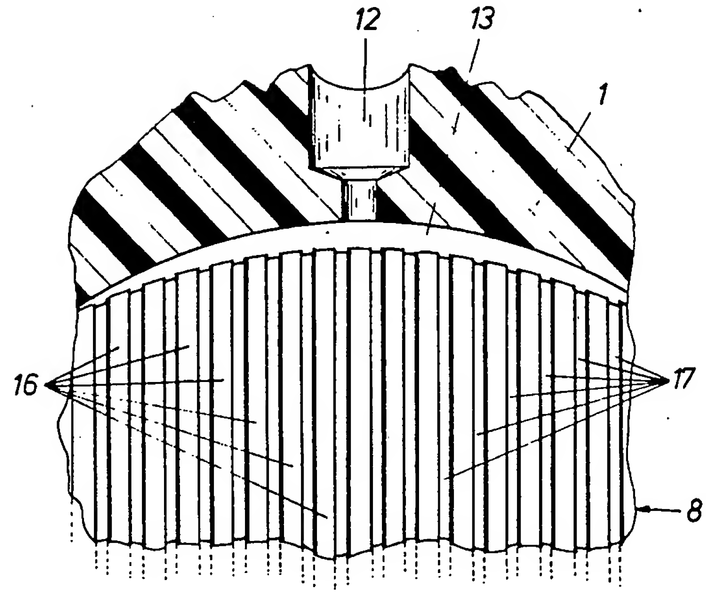


Fig.7



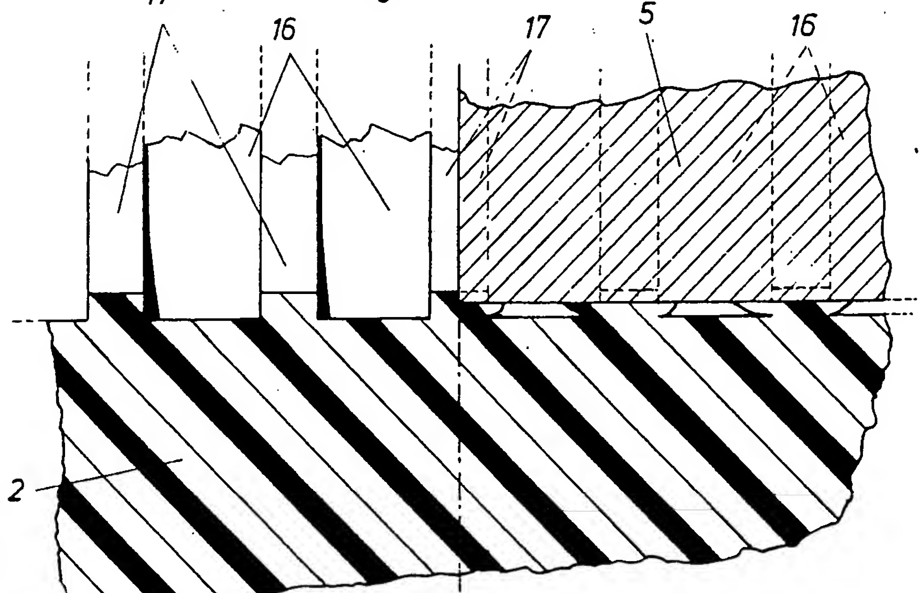


Fig.8

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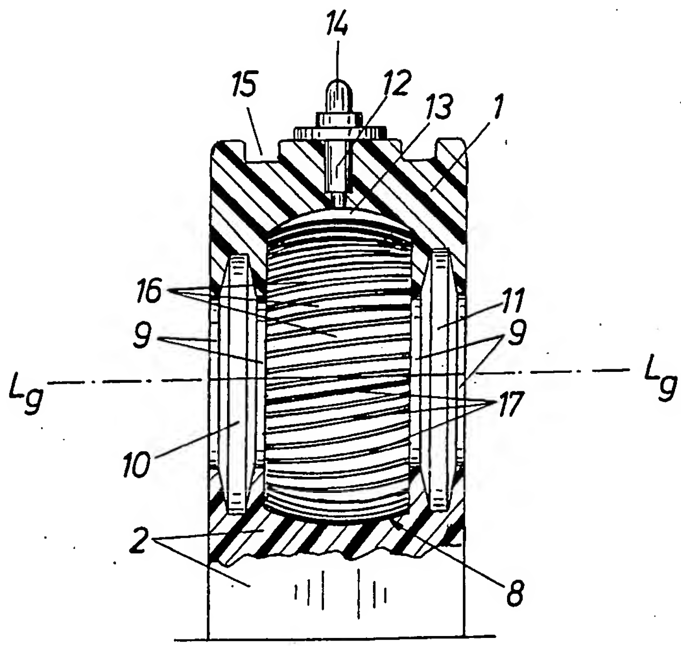


Fig.9

SPECIFICATION

## Bearing housing

The present invention is directed to a bearing housing of synthetic plastics material with a facility for adaptation of the bearing seat in the bearing chamber.

Bearing housings produced in an injection moulding process regularly display non-circular bearing chamber walls, because the plastics material, in consequence of unequal wall thicknesses, sets unequally during the cooling and drying following the injection moulding process. Although relatively small deformations are concerned, often they do suffice to impair the function of the bearing in that they put the bearing seat in question. It can even occur that the bearing chamber becomes too small or too large and does not permit the bearing to be assembled.

These problems do not occur in the case of bearing housings of metal, since the bearing chamber in such bearing housings is further processed to be an exact fit and is accurately centred in a machining operation after the casting. However, a significant advantage of a bearing housing of synthetic plastics material produced in an injection moulding process is that the expensive further processing becomes redundant. Although the possibility exists of eliminating the non-circularity of the bearing chamber by means of further processing, it is excluded for economic reasons as the bearing housing of synthetic plastics material would than be less competitive.

A one-piece bearing housing has become known, at which a separating slot is arranged to extend up to the bearing chamber wall. By means of a clamping screw disposed at the separating slot, the bearing chamber wall is clamped tight around the bearing. Due to the bearing chamber before clamping possessing a somewhat larger cross-section than the outer circumference of the bearing, the bearing can be reliably clamped fast in the bearing chamber. A non-circularity of the bearing chamber wall, which may exist through removal from the mould and setting of the bearing housing, will in this manner remain without significance for the mounting and fastening of the bearing.

This known bearing housing of synthetic plastics material has been well accepted on the market. It can however be executed only in one piece and indeed merely for smaller and medium sizes, since the strength demands on the material around the clamping screw as well as in the upper housing region are naturally very high. Furthermore, the clamping-in of the bearing will in only rare cases take place in such a manner that the contact surfaces of the separating slot actually contact one another without the bearing being clamped in so hard that the rotation of the bearing shells in relation to each other is made more difficult. When however a slot still remains open between the contact surfaces, the synthetic material becoming plastic at higher operating temperatures can flow into this slot, thereby causing the bearing to become detached from the bearing chamber.

The principle of the above described bearing housing is not generally applicable to bearing housings of synthetic plastics material. If one were for example to transfer this to a two-piece bearing housing, since the bearing chamber would always have to display a somewhat smaller cross section than the bearing to be clamped in; when clamping in the bearing, the same problem as those described above would result at the assembly screws, since a screwing together into a rigid block would then also be possible only with too high a tightening pressure, i.e. the motion of the bearing shells in relation to each other would be hindered. If on the other hand gaps remain open between the bearing housing parts, the synthetic material, which has become plastic at higher operating temperatures, could flow into these and lead to a weakening of the clamping. With bearing housing of synthetic plastics materials, only screw fastenings into a rigid block can ensure that the synthetic material does not flow out at the screw fastenings when operating temperatures exceed 80° to 100°C.

The present invention has the object of creating a bearing housing, which is produced of synthetic plastics material in an injection moulding process and having a bearing seat such that non-circularities and other deformations arising in consequence of the production process are automatically compensated in the course of the assembly of the bearing. A further object of the invention is to give the bearing clamped into the bearing chamber a certain displaceability along the axis in spite of adequate clamping-in. Finally, the automatic compensation of deformations shall also be able to serve to absorb without stress slight deviations of the bearing axis (shaft axis) from the longitudinal axis of the bearing housing (longitudinal axis of the chamber).

According to the present invention there is provided a bearing housing of plastics material comprising a bearing chamber for receiving a bearing and having a circumferential surface provided with a plurality of protrusions directed towards the longitudinal axis of the chamber.

Embodiments of the present invention will now be more particularly described by way of example with reference to the accompanying drawings, in which:-

*Figure 1* shows a side elevation of a two-piece pedestal bearing embodying the present invention,

*Figure 2* is a section taken along the line X-X of Figure 1, the housing being equipped with a ball or roller bearing,

*Figure 3* is a similar section along X-X of Figure 1, showing the encircling ribs arranged on the cylindrical circumference of the bearing chamber,

*Figure 4* is a section along X-X of Figure 1, showing a second embodiment wherein knobs are formed instead of ribs at the cylindrical circumference of the bearing chamber,

*Figure 5* is a section along X-X of Figure 1, showing a third embodiment in which the circumference of the chamber displays a curvature, the concave side of which is directed towards the longitudinal axis of the bearing housing and the cross-section of which represents a part of a circular arc,

*Figure 6* is the section shown in Figure 5, with an inserted ball or roller bearing,

*Figure 7* is an enlarged view of part of the section shown in Figure 5,

*Figure 8* is an enlarged view of the part "A" of the section shown in Figure 3, in one half of which the cross-sections of the ribs and the grooves are illustrated before clamping-in of the bearing, while the other half illustrates the deformation of the ribs that takes place after the clamping-in of the bearing, and

*Figure 9* is a section along X-X of Figure 1, showing a fourth embodiment wherein the grooves and ribs extend helically around the longitudinal axis of the bearing housing.

Referring now to the drawings, the bearing housing is composed of two housing parts 1 and 2 and is produced from a glass fibre-reinforced polyacetate in an injection moulding process. The lower part 2 is fastened by means of fastening screws 3 and 4 to a firm support (not shown). After insertion of the bearing 5 (ball or roller bearing or the like), the upper part 1 is screwed to the lower part 2 to form a rigid block by means of the screws 6 and 7.

The bearing housing 1 and 2 contains in the centre a bearing chamber 8 and is traversed by a shaft channel 9. The effective circumferential cross-section of the bearing chamber 8 is slightly smaller than the outer cross-section of the bearing. Sealing chambers 10 and 11 are arranged one on each side of the bearing chamber 8. A lubricant channel 12 leads from above into the bearing chamber 8 and here opens into a space serving as lubricant chamber 13 of the bearing chamber. The lubricant channel 12 is closed off outwardly by a lubricant nipple 14. The hollow spaces 15 are arranged partly for the saving of material and partly for cooling.

Circumferential grooves 16, defining ribs 17, are formed around the cylindrical shell of the bearing chamber 8 illustrated in Figure 3. When the bearing 5 is placed in the lower part 2 of the bearing housing and the upper part 1 is screwed on, the ribs 17 deform under the clamping pressure until the circumference of the bearing chamber 8 has adapted to the cross-section of the bearing 5. As shown in Figure 4, knobs 18 may replace the ribs 17 at the circumference of the bearing chamber 8. These knobs are illustrated as relatively large squares but it would be preferable to use a greater number of smaller circular knobs.

The adaption of the bearing chamber circumference to the outer ring of the bearing, which constrainedly takes place during the screwing together of the bearing housing 1 and 2, can be utilised to allow a certain angular deviation of the bearing axis and thereby of the longitudinal axis $L_w$ of the shaft from the longitudinal axis $L_g$ of the bearing housing. Figure 5 shows a bearing chamber 8, the circumference of which is curved, the concave side of the curve being directed towards the longitudinal axis $L_g$ of the bearing housing and the cross-section of which represents a part of a circular arc. The lubricant chamber 13 is not a part of this curvature, but a narrow additional axial space extending from the bearing chamber as evident in Figures 1 to 4.

For this domed bearing chamber one uses a bearing with a correspondingly domed outer ring. Bearings of that kind are commercially available and the radius of doming of the bearing chamber corresponds to the customary radius of doming of the outer ring for a given bearing size.

If after such a bearing 5 with shaft 19 is bedded into the lower part of the bearing housing 2 and the upper part 1 of the bearing housing loosely screwed on, the alignment of the two bearing housings does not agree exactly, the longitudinal axis $L_w$ of the shaft will form a small angle W with the longitudinal axis $L_g$ of the housing. When the upper part 1 of the bearing housing has been screwed fast, this angle W is constrainedly taken into consideration and the shaft 19 turns in its bearings without any axial stress.

The magnitude of the angle W which may arise between the longitudinal axis $L_g$ of the housing and the longitudinal axis $L_w$ of the shaft or bearing, is dependent on the capability of the seals 20 and 21 reliably to seal the shaft even in an inclined position thereof. This limit lies around 1° to 2° with commercially usual sealing rings.

Particularly in the case of the domed bearing chamber, it can in some circumstances be expedient to let the ribs 16 extend parallel or substantially parallel to the longitudinal axis $L_g$ of the housing or also flatly helically around this, as shown in Figure 9.

In Figures 7 and 8 the ribs 17 and the grooves 16 are illustrated in a practicable relationship, however greatly enlarged (here about 5:1 to 4:1 for a cross-section of the shaft of 20 to 30 millimetres). In a preferred embodiment valid for the shaft cross-sections of 20 to 30 millimetres, depth and width of a groove amount to 0.2 and 1.0 millimetres, respectively. The corresponding rib is 0.5 millimetres wide. These values are designed for bearing housings of other synthetic material.

Figure 8 shows on one (left hand) half the original cross-section of the encircling grooves 16 and the ribs 17; the other half shows the deformation of the ribs 17 caused by the clamping-in of the bearing 5. This deformation assures that the non-circularities almost always existing after the production of the bearing chamber wall are compensated by the deformation of the ribs (or knobs). This makes possible the inclined position, illustrated in Figure 6 of the shaft 19 relative to the longitudinal axis $L_g$ of the bearing housing.

Free displacement along the longitudinal axis of a bearing clamped into a rigid block in the bearing housing is unavoidable for absorbing changes in length caused by temperature in the journalled shaft without the bearing housing being urged away in extreme cases. This displacement is not soluble by simply structuring the cross-section of the bearing chamber to be smaller than the cross-section of the bearing in the case of a one-piece bearing housing with separating slot or in the case of a two-piece bearing housing (for example pedestal bearing housing) and than clamping in the bearing by means of screw tightening so far that it sits adequately fast without hindering the bearing function. In that case, a slot will in most cases remain open between the housing parts; the synthetic material becomes plas-

tic at higher operating temperatures, such as 80° to 100° and excapes into the space of the slot or slots. The clamping-in yields and the bearing has become a loose bearing.

Conversely, too fast a clamping-in of the bearing in the bearing chamber, when the housing parts are thus screwed together into a fast block causes the bearing to display no displaceability along the longitudinal axis in the bearing chamber; and in the case of changes in length of the journalled shaft, the bearing housing can in some circumstances be urged away and the bearing be destroyed.

In consequence of the arrangement of ribs or knobs at the circumferential wall of the bearing chamber, it has for the first time become possible, in spite of non-circularities and other deformation at the bearing seat caused during production, to clamp the bearing into a fast block always up to a flush contact of the housing parts without ever having to over-draw the clamping pressure, and in spite of adequately fast clamping-in, the rotary function of the bearing remains unhindered and the clamping-in is not impaired by higher operating temperatures, since it always takes place into a fast block.

CLAIMS

1. A bearing housing of plastics material comprising a bearing chamber for receiving a bearing and having a circumferential surface provided with a plurality of protrusions directed towards the longitudinal axis of the chamber.

2. A bearing housing as claimed in claim 1, wherein each of the protrusions is a riblike element spaced from adjacent riblike elements by grooves formed in the cicumferential surface of the bearing chamber.

3. A bearing housing as claimed in claim 1, wherein each of the protrusions is a knob shaped element.

4. A bearing housing as claimed in claim 2, wherein the grooves extend transversely to the longitudinal axis of the chamber.

5. A bearing housing as claimed in claim 2, wherein the grooves extend parallel to the longitudinal axis of the chamber.

6. A bearing housing as claimed in claim 2, wherein the grooves extend helically around the chamber.

7. A bearing housing as claimed in any one of the preceding claims, wherein the circumferential surface of the bearing chamber is concavely curved.

8. A bearing housing as claimed in any one of the preceding claims, wherein a reservoir for lubricant is provided at a concavely curved portion of the circumferential surface of the bearing chamber.

9. A bearing housing of plastics material substantially as described herein with reference to and as illustrated in Figures 1 to 3 and 8 of the accompanying drawings.

10. A bearing housing of plastics material substantially as described herein with reference to and as illustrated in Figures 1 and 4 of the accompanying drawings.

11. A bearing housing of plastics material substantially as described herein with reference to and as illustrated in Figures 1 and 5 to 7 of the accompanying drawings.

12. A bearing housing of plastics material substantially as described herein with reference to and as illustrated in Figures 1 and 9 of the accompanying drawings.

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